Instruction Manual

BCS

(Basic Control Structure) Protocol

AMX AutoPatch Communication Protocol

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Introduction to BCS

This instruction manual is designed for programmers who wish to create their own control programs using the BCS (Basic Control Structure) protocol. BCS is a simple character stream control protocol used by external control devices attached to a number of AMX products, e.g., AutoPatch Matrix Switchers, the HDMI-UTPRO-0808, and Enova DGX 8/16/32 Digital Matrix Switchers. BCS commands are used primarily for control of a matrix switcher during system installation and setup and for diagnostic purposes. Internally, BCS commands are translated into XNNet protocol packets.

Important: *We strongly recommend checking Appendix A (see page 25) for information about BCS commands specific to your equipment. Not all systems support all BCS commands.*

Overview

BCS is a set of alphanumeric characters that combine to form control commands. BCS command strings are entered into a terminal emulation program (such as Windows® HyperTerminal) running on an external control device. The control device (AMX control device, PC, or third-party controller) sends the commands to the system. Control devices must be able to send and receive ASCII code via an RS-232 or RS-422 serial port. (For information on attaching external controllers, see the "Installation and Setup" chapter of the specific enclosure's instruction manual.)

BCS commands can also be used for APWeb macros, diagnostics, and Telnet sessions, as well as in AMX AutoPatch software applications (e.g., APControl).

For advanced programmers who want access to the underlying XNNet packet based protocol, the *AMX AutoPatch CD* (that ships with each system) includes the XNNet Communication Library. This interface library supports C, Java, and Visual Basic and has examples of the XNNet Protocol in use.

General rules, as well as lists and tables for command string formats and command string responses, are provided first for quick reference. Detailed information and examples for creating and executing the various commands can be found in the subsequent chapters. For product specific information, see page 25.

Command String Formats

A command string is a series of command characters and numbers used to send commands to the system.

Commands can include basic ones for executing and disconnecting switches, as well as for verifying the status of switches. Commands can execute local presets or define and execute global presets. On systems with audio, commands can be used to control a variety of audio functions depending on the product (e.g., adjustments to tone and balance are available on the Precis DSP).

In a command string, each character is either a general command (e.g., "D" for Disconnect) or an identifier that indicates what the following number designates (e.g., "I" and the number following it designate an "input number").

The command string CL1I27O160T can be interpreted as follows:
[C] Change on [L1] Level 1, [I27] Input 27 to [O160] Output 160, [T] Take to execute the command.

For a complete list of command characters and their functions, see page 4.

Command characters and numbers are echoed back to the terminal screen as the system accepts them. When a command is successfully executed, all of the characters appear as entered. If a command character or a number is not accepted, the system responds with a different character and all or part of the command is not executed. For explanations of other possible responses, see page 5.

General Rules for Using BCS Commands

- Command strings typically are not case-sensitive (for exceptions – see “Heritage Systems” on page 37).
- All command strings *must* end with the Take command “T” which tells the system to execute the command.
- “O” is the letter O, not the number zero (0)
- Entering “X” at any point in a command string cancels the command.
- A command cannot be canceled after the “T” has been entered.
- Command strings cannot be edited. If a mistake has been made, enter an “X” and then reenter the command.
- To specify multiple outputs, inputs, levels, or local presets, enter a space “ ” between each number. Multiple inputs are only valid in Disconnect commands.
- To specify a range of outputs, inputs, or local presets, insert a colon “**:**” between the lowest and highest numbers of the range (not supported if the command is otherwise invalid, e.g., cannot specify a range of inputs in a Change command; the first input only would be routed.).
- Colons “**:**” and spaces “ ” can be used in the same command string.
- If the level designation “L” is omitted, the command is executed on the default level, which is normally Level 0.

* For systems where all of the audio channels are not switched on the same level (e.g., an audio only Optima that routes 8 channels of audio on Level 1 and 16 channels on Level 2), volume and input gain commands for each of the levels *must* be entered separately.

Note: *Groups of signals (e.g., RGBHV plus stereo) and breakaways of signals (e.g., RGBHV only or stereo only) are stored in the configuration definition as virtual matrices (VMs). While some methods of control (e.g., control panels) use the term “VM”, BCS commands on a serial controller use the equivalent term “level” designated by an “L”. For the purposes of this document, the terms virtual matrix and level are interchangeable.*

Generating BCS Commands

Important: *We strongly recommend checking Appendix A (page 25) for information about BCS commands specific to your equipment. Not all systems support all BCS commands.*

Basic and Preset Commands

To generate basic and preset BCS commands:

1. Enter commands using the formats from the tables below. Replace the "#"s with the appropriate level, input (source), output (destination), local preset, or global preset number.

Basic Command Strings	
To execute a switch	`CL#I#O#T` or `CL#O#I#T`
To disconnect a switch	`DL#I#T` or `DL#O#T`
To verify switch status	`SL#O#T` or `SL#I#T`

Preset Command Strings	
To execute a local preset	`RL#P#T`
To define a global preset	`RR#T`
To execute a global preset	`R#T`

Digital Output Volume and Digital Input Gain Commands

To use audio commands, your system must contain audio components that support the specific audio commands. The decibel level resulting from an output volume or input gain adjustment command *must* fall within the range of the audio specifications (for a specific audio output volume or input gain adjustment range, see the specifications for that specific audio board or connector set in the product's instruction manual). Audio commands can only be executed on levels that switch audio.

Important: *Do not use leading zeros for gain values in audio commands.*

To generate digital output volume and digital input gain BCS commands:

1. Enter commands using the formats from the tables below. Replace the "#"s with the appropriate level and input (source) or output (destination) number. Replace the "^^^" with the decibel level entered as an integer number representing the desired decibel value multiplied by 10 (e.g., +8.0 dB is entered as 80 and -40.5 dB is entered as -405).

Digital Output Volume Command Strings	
To adjust volume *to* a specific (absolute) value	`CL#O#VA^^^T`
To adjust volume *by* a specific (relative) amount	`CL#O#VR^^^T`
To adjust volume up or down a step (increment/decrement)	`CL#O#VS+T` or `CL#O#VS-T`
To mute or un-mute the volume of an output	`CL#O#VMT` or `CL#O#VUT`
To verify volume status	`SL#O#VT`

Caution: *We strongly recommend that input gain adjustments be made only by a qualified installer or dealer.*

Digital Input Gain Command Strings	
To adjust input gain *to* a specific (absolute) value	`CL#I#VA^^^T`
To adjust input gain *by* a specific (relative) amount	`CL#I#VR^^^T`
To adjust input gain up or down a step (increment/decrement)	`CL#I#VS+T` or `CL#I#VS-T`
To verify input gain status	`SL#I#VT`

Note: *For information on DSP (Digital Signal Processing) commands, see page 20.*

BCS Command Tables

The table below shows BCS command characters (keys) used to generate control commands, their functions, and short function descriptions.

Basic and Preset Command Characters		
Key	**Function**	**Description**
C	Change	Initiates a Change (execute switch) command; this must precede the level, input, and output specification
D	Disconnect	Initiates a Disconnect switch command; this must precede the level and input or output specification
S	Status	Initiates a Status command; this must precede the level and input or output specifications
L	Level	Indicates the number following is the level
0 – 9	Number	Identifies input, output, preset, level, and decibel values; combine the digits to form larger numbers
I	Input	Indicates the number following is an input (source)
O	Output	Indicates the number(s) following is an output(s) (destination) **Note**: O *is the letter* O*, not the number zero (*0*)*
" "	Space	Separates numbers in entries containing multiple numbers
:	Range	Specifies a range of numbers in entries containing multiple numbers
T	Take	Executes a command
X	Exit	Exits, or cancels, the command being entered
R	Execute Preset	Initiates an Execute Global Preset command by indicating that the number following it is a global preset number Also initiates an Execute Local Preset command when it precedes the level and the local preset character P
P	Local Preset	Indicates the number following is a local preset number
RR	Define Global Preset	Initiates a Define Global Preset command

Digital Output Volume and Digital Input Gain Command Characters		
Key	**Function**	**Description**
V	Volume (for Status)	Used in Status commands for volume and input gain
VA	Volume Absolute	Indicates the number following is the volume adjustment *to* a specific decibel level
VR	Volume Relative	Indicates the number following is the volume adjustment *by* a specific decibel amount
VS+	Volume Increment	Adjusts volume of a specified output up a step
VS–	Volume Decrement	Adjusts volume of a specified output down a step
VM	Volume Mute	Applies mute to the volume
VU	Volume Un-mute	Removes mute from the volume

Digital Signal Processing (DSP) Command Characters		
Key	**Function**	**Description**
P	Balance Pan	Pans the balance left or right by a percentage of total range
F	Filter (Tone)	Indicates the number following is the tone band (filter) designation
E	Equalization Band	Indicates the number following is an equalization band
G	Gain Adjustment	Indicates the number following is the decibel level, used only in tone and equalization commands

Command String Responses

When command characters are entered into a terminal emulation program (such as HyperTerminal) and accepted by the system, they are echoed back to the terminal screen one at a time, as they are typed. The complete command has executed successfully when all of the entered characters including the entered Take command "T" appear. If a command character is not accepted, a different character than the one entered appears and all or part of the command is not executed.

BCS Response Table

The following table shows BCS response characters, with descriptions and meanings, that may appear instead of an entered character or number. If these characters appear, all or part of the command is not executed.

For troubleshooting strategies when error codes appear, see Appendix B "Error Code Reporting," starting on page 41.

Response	Meaning	Description
?	Format Error	Indicates an error in the command string format or syntax (e.g., not indicating an input in a Change command)
X	General Error	Indicates the system rejected all or part of the command (e.g., entering an invalid value such as Output 300 in a system that only has 256 outputs). All valid parts of the command will be executed
E#	Error	Indicates an error code number*
W#	Warning	Indicates a warning code number*

* For code number information on Error or Warning responses, note the specific number and see Appendix B, "Error Code Reporting" (page 41).

Command String Response Examples

BCS Command Entered	Appears in Terminal Emulation Program	Explanation of Result
CL2I3O5T	CL2I3O5T	The command was successfully executed
CL2I3T	CL2I3?	The command was not executed because the output number was not included
CL2I3O55T	CL2I3O55X	The command was not executed because the system does not have an Output 55
CL2O5VA150T	CL2O5VA150X	The command was not executed because 15 dB is outside the volume range for Output 5
CL2I3O5T	CL2I3O5E1000A	The command was not executed because a timeout failure occured

Executing Switches

A switch is an active connection between an input (source) signal and one or more output (destination) devices. The signals connected in a switch command are either individual signals or groups of signals coming through the connectors on the rear of the enclosure. When executing a switch, you must specify a level that contains all the signals you want to route (or the switch will execute on the default level, normally 0). Levels are determined in the configuration definition that has been loaded onto each CPU in the system.

A switch command string begins with the character "C" which initiates a Change command for routing a switch. The characters and numbers that follow the "C" command tell the system which inputs and outputs to connect on which level. The last character is the Take "T" command which tells the system to execute the command.

For example, the command string CL0I102O39T can be interpreted as follows:
[C] Change on [L0] Level 0, [I102] Input 102 to [O39]Output 39, [T] Take to execute the command.

For a complete list of command characters and their functions, see page 4.

Command characters and numbers are echoed back to the terminal screen as the system accepts them. A command has successfully executed when the entered "T" command appears. If a command or number is not accepted, a different character appears and all or part of the command is not executed. For explanations of other possible responses, see page 5.

In each Change command, you can enter multiple levels and multiple outputs (destinations), but only one input (source). To enter multiple levels and outputs, include a space between each set of numbers. To enter a range of outputs, insert a colon ":" between the lowest and highest numbers of the range.

If the level is not specified in the Change command, the command is executed on the default level, which is normally Level 0 (e.g., CI72O35T routes Input 72 to Output 35 on Level 0).

Important: *If the level is not specified in a BCS command, the command is executed on the default level (normally Level 0), which is defined in the configuration file. If the level is omitted and the BCS command executes on an unexpected level, check the default level in the configuration file (for systems without a configuration file, check the product documentation).*

The following instructions provide command string formats for executing switches by designating either an input or one or more outputs first.

To execute a switch:

1. Enter the Change command below. Replace the "#"s with the level, input, and output number(s).
   CL#I#O#T or CL#O#I#T

Change Examples

BCS Command	Action
CL1I6O24T	Switches Input 6 to Output 24 on Level 1
CL1I6O2 4 9T	Switches Input 6 to Outputs 2, 4, and 9 on Level 1
CI6O9T	Switches Input 6 to Output 9 on the default level (defined in configuration file, normally Level 0)
CL0O2I5T	Switches Input 5 to Output 2 on Level 0
CL2I6O4:8T	Switches Input 6 to Outputs 4, 5, 6, 7, and 8 on Level 2
CL1 2I4O5 6T	Switches Input 4 to Outputs 5 and 6 on Levels 1 and 2
CL0I3O4:7 9 13:16T	Switches Input 3 to Outputs 4, 5, 6, 7, 9, 13, 14, 15, and 16 on Level 0
CL2I6X	Cancels the incomplete command

Disconnecting Switches

The characters and numbers in a Disconnect command tell the system which input or output to disconnect on which level. Command characters and numbers appear on the screen when the system accepts them. A command string has successfully executed when the entered "T" command appears. If a character or number is not accepted, a different character appears and all or part of the command is not executed. For explanations of other possible responses, see page 5.

In disconnect commands, enter multiple levels and outputs or inputs by including a space between each set of numbers. (You cannot enter multiple inputs and outputs in the same disconnect command.) Enter a range of outputs or inputs by inserting a colon "**:**" between the lowest and highest numbers of the range.

If the level is not specified in the Disconnect command, the command is executed on the default level, which is normally Level 0 (e.g., DO67T disconnects Output 67 on Level 0).

Important: *If the level is not specified in a BCS command, the command is executed on the default level (normally Level 0), which is defined in the configuration file. If the level is omitted and the BCS command executes on an unexpected level, check the default level in the configuration file (for systems without a configuration file, check the product documentation).*

Caution: *Disconnecting an input disconnects all the outputs receiving that source signal.*

The following instructions provide command string formats for disconnecting switches by designating either inputs (sources) or outputs (destinations).

To disconnect a switch:

1. Enter the Disconnect command below. Replace the "#"s with the level and output number(s) or the level and input number(s).
   DL#O#T or DL#I#T

Disconnect Examples

BCS Command	Action
DL0O8T	Disconnects Output 8 on Level 0
DO3T	Disconnects Output 3 on the default level (defined in configuration file, normally Level 0)
DL2O3 5:9 11T	Disconnects Outputs 3, 5, 6, 7, 8, 9, and 11 on Level 2
DL2I5T	Disconnects *all* outputs connected to Input 5 on Level 2
DL3I7 9 15T	Disconnects *all* outputs connected to Inputs 7, 9, and 15 on Level 3

Verifying Signal Status

Switch status can be checked to confirm that the switch has executed correctly or to confirm correct routing to multiple outputs. Digital output volume status (see page 15) and digital input gain status (see page 18) can also be verified. The characters and numbers in a Status command tell the system which input or output to verify on which level. A Status command has successfully executed when the entered "T" appears followed by the result of the status query in parenthesis. Empty parenthesis ( ) indicate that the input or output specified is not routed on the specified level. For status response examples responses, see below.
Fragmented status results (see page 9) are available for systems that support this feature. Fragmented Status Reporting *must* be enabled in XNConnect before valid fragmented results can be returned (see the XNConnect Help file).

General Rules for Verifying Status

- Multiple inputs, outputs, or levels cannot be entered in a Status command.
- If the level is not specified in the Status command, the command is executed on the default level, which is normally Level 0 (e.g., SI83T verifies the routing status of Input 83 on Level 0).
- If you check the status for an input or an output on an audio-follow-video level and only the video or the audio is routed on that level, the result will come back as not routed, unless the system supports fragmented status reporting.

Important: *If the level is not specified in a BCS command, the command is executed on the default level (normally Level 0), which is defined in the configuration file. If the level is omitted and the BCS command executes on an unexpected level, check the default level in the configuration file (for systems without a configuration file, check the product documentation).*

To verify signal status:

1. Enter the Status command below. Replace the "#"s with the level and input number or the level and output number.
   SL#I#T or SL#O#T
   The results of the BCS command will display in parentheses; empty parentheses ( ) indicate that no input is routed to the output being verified or that no outputs are receiving a signal from the input being verified.

Status Examples

BCS Command	Response	Explanation of Result
SL3O4T	SL3O4T(6)	Output 4 is connected to Input 6 on Level 3
SL0I4T	SL0I4T(2 7 8 11)	Input 4 is routed to Outputs 2, 7, 8, and 11 on Level 0
SL1O17T	SL1O17T( )	Output 17 is not connected to an input on Level 1

Fragmented Status

The system may also support fragmented status reporting. (To determine if your system supports fragmented status reporting, see Appendix A which starts on page 25.) This feature must be enabled in XNConnect. If reporting is not enabled, the status result will display empty parentheses: `( )`.
When fragmented status reporting is enabled, a fragmented status result is indicated by a `( # )`.

The `( # )` or `( )` indicate that either no input is routed to an output or that the full definition of an input is not connected to the same output.

For example, audio and video signals from Input 5 are routed to Output 9 on the audio-follow-video level `(L0)` and the audio from Input 5 is also routed to Output 10 on the audio level (`L2`).

- The results of checking status on Input 5 on the audio-follow-video level (`L0`) would be "`SL0I5T( 9 10# )`." This indicates that Output 9 is connected on all defined components of Input 5 on Level 0 and that Output 10 is connected on some, but not all, of the components of Input 5 on Level 0.
- The results of checking the status of Output 10 on the audio-follow-video level (`L0`) would be "`SL0O10T( # )`." This indicates that Output 10 is connected but not receiving all of the components from an input (Input 5) on Level 0.

Fragmented Status Examples

BCS Command	Response	Explanation of Result
`SL0I4T`	`SL0I4T( 6# )`	Input 4 is only sending part of the defined components for Level 0 to Output 6
`SL0O7T`	`SL0O7( # )`	Output 7 is receiving only part of the defined components from an input on Level 0 **or** The defined components are originating from different inputs, e.g., the video is coming from a different input than the audio

Executing Presets

Presets Overview

This chapter provides information for executing local presets and for defining and executing global presets using BCS commands. Presets are not supported on all systems (see Appendix A on page 25).

Local Preset

A local preset is a predetermined collection of switches (on the same level) to be routed simultaneously. Executing a local preset will affect only those inputs and outputs specified, not the whole system.

If your system supports local presets, they must be defined (created) in XNConnect and then loaded into the system. For directions for creating local presets, see the XNConnect Help file.

Global Preset

A global preset allows you to replicate an entire system state (all signal routings regardless of the number of levels involved), including audio gain/volume settings. If your system supports global presets, they can be defined (created) using BCS commands during runtime and stored by the system. If the system is reconfigured, global presets may be lost, depending on the method used to load the configuration file (see the XNConnect Help file).

Local Presets

A local preset is a set of switches on a single level that is stored in a system's configuration file. If requested, local presets can be programmed at the factory; contact your AMX representative. To program them yourself, use the XNConnect software located on the *AMX AutoPatch CD* or at **www.amx.com**.

General Rules for Local Presets

- Executing a local preset does not change any system routings that are not part of the preset.
- Local presets cannot be used to change any of the audio settings.
- If two local presets are executed in the same command, both will be executed. If both include routing instructions for the same input or output, the input or output will be routed according to the last local preset entered.
- You can execute multiple local presets on the same level by including a space between each local preset number in the BCS command.
- You can execute a sequential range of local presets by inserting a colon "`:`" between the lowest and highest local preset numbers in the BCS command.
- If the level designation "`L`" is omitted, the Execute Local Preset command is executed on the default level, which is normally Level 0.
- Multiple levels can be entered in an Execute Local Preset command provided that a local preset with the same number resides on all the specified levels. For example, `RL1 2P3T` would execute the switch(es) defined as Local Preset 3 on Level 1 and execute the switch(es) defined as Local Preset 3 on Level 2.

Important: *If the level is not specified in a BCS command, the command is executed on the default level (normally Level 0), which is defined in the configuration file. If the level is omitted and the BCS command executes on an unexpected level, check the default level in the configuration file.*

Tip: *When you know you will need to disconnect all the switches routed by one or more local presets (on the same level), an efficient strategy is to create another local preset to do so.*

To execute a local preset:

1. Enter the Execute Local Preset command below. Replace the "#"s with the level and local preset number(s).
   RL#P#T

Execute Local Preset Examples

BCS Command	Action
RL0P2T	Executes Local Preset 2 on Level 0
RL1P12T	Executes Local Preset 12 on Level 1
RLP7T	Executes Local Preset 7 on the default level (defined in configuration file, normally 0)
RL3P1 2T	Executes Local Presets 1 and 2 on Level 3
RL3 1P1T	Executes Local Preset 1 on Level 3 and Local Preset 1 on Level 1

Global Presets

A global preset is a snapshot of a system's routing state. The routing state is all routings on all levels (including audio settings) for all enclosures in a system. Once the system state has been captured with an "RR" Define Global Preset command, it can then be restored at any time with the "R" Execute Global Preset command. Global presets cannot be defined in XNConnect.

Note: *We strongly recommend keeping track of the numbers and the system state routings used for each global preset. If another system state is assigned to a previously used number, the former state will automatically be overwritten.*

To define a global preset:

1. Route the system to the desired state and enter the Define Global Preset command below. Replace the "#" with the global preset number.
   RR#T
   It may take several seconds for the "T" to appear, depending on the type and size of the system.

Define Global Preset Examples

BCS Command	Action
RR1T	Defines the current system state as Global Preset 1
RR3T	Defines the current system state as Global Preset 3
RR5X	Cancels the incomplete command

To execute a global preset:

1. Enter the Execute Global Preset command below. Replace the "#" with the global preset number.
   R#T

Execute Global Preset Examples

BCS Command	Action
R1T	Executes Global Preset 1
R3T	Executes Global Preset 3
R2X	Cancels the incomplete command

Note: *Status is not invalidated by global presets.*

Adjusting and Verifying Audio

For BCS purposes, adjustments to *input* audio signals are referred to as digital *gain* adjustments, while similar adjustments to *output* audio signals are referred to as *volume* adjustments. Not all systems support digital input gain or digital output volume control. If your system supports these features, adjustments may be made at any time during normal operation.

General Rules for Audio

- Volume is adjusted using any of the following three methods:
  - Absolute – adjusts volume *to* a specific decibel level.
  - Relative – increases or decreases volume *by* a specific decibel amount.
  - Increment/Decrement – increases or decreases volume a step.
- An output does not need to be routed to adjust the volume; however, it may be helpful to hear the adjustment.
- Audio adjustments can only be executed on a valid level that switches audio signals. If an audio adjustment is attempted on a level that does not include audio, an error code may be sent out (see page 41).
- For systems where all of the audio channels are not switched on the same level (e.g., an audio only Optima that routes 8 channels of audio on Level 1 and 16 channels on Level 2), volume and input gain commands for each of the levels *must* be entered separately.
- Output volume adjustments remain in effect when the output is switched to receive a different input or is switched on a different level (e.g. from audio only to audio-follow-video).
- Specify multiple outputs by including a space between each output number. Specify a range of outputs by inserting a colon "**:**" between the first and last numbers of the range.
- Enter decibel levels as an integer number representing the desired decibel value multiplied by 10. For example, +5 dB is entered as 50 and -60.5 dB is entered as -605. (Interpret results for a volume status command in the same way.)
- Do *not* use leading zeros for gain values in audio commands.
- When a muted output is un-muted, the output returns to its previously un-muted volume.
- When a Volume command is sent to a muted output, the output is automatically un-muted and then the volume adjustment is applied. When an input gain command is sent to an input connected to a muted output, the gain is applied to the input and the output remains muted.
- The volume range of an output is determined by the audio board/connector. For a specific audio volume range, see the specific board/connector documentaion. If the requested volume change results in a decibel level outside the range specified by the board/connector, the system responds with "X" indicating that an invalid value was entered.
- The total through-system gain (the amount of input gain plus the amount of output gain) for any input to output routing path is automatically limited by the matrix switcher. (For the value of through-system gain and other audio specifications, see your matrix switcher's instruction manual.) If a volume command is entered that exceeds the matrix switcher's specifications, the command will be accepted (and will be indicated in status results) but will not result in an audible difference if the dB value entered is outside of the matrix switcher's audio range.

Important: *If the level is not specified in a BCS command, the command is executed on the default level (normally Level 0), which is defined in the configuration file. If the level is omitted and the BCS command executes on an unexpected level, check the default level in the configuration file (for systems without a configuration file, check the product documentation).*

Adjusting Volume

To adjust volume use any of the following three methods:

- Absolute – adjusts the volume *to* a specific decibel level
- Relative – increases/decreases the volume *by* a specific decibel amount
- Increment/Decrement – increases or decreases the volume a step

Absolute Method

The Absolute Method adjusts the volume of an output *to* a specific decibel level.

To adjust an output's volume to a specific decibel level:

1. Enter the Volume Absolute command below. Replace the "#"s with the level and output number(s) and replace the "^^^" with the decibel level (entered as a decimal number; see "General Rules for Audio" on the previous page).
   `CL#O#VA^^^T`

Volume Absolute Examples

BCS Command	Action
`CL0O3VA100T`	Adjusts volume to 10.0 dB for Output 3 on Level 0
`CL0O6 7VA-700T`	Adjusts volume to -70.0 dB for Outputs 6 and 7 on Level 0

Note: *If the decibel level requested is outside the range for the selected output, the system will respond with an "X" indicating an invalid value was entered (for a specific audio board's volume adjustment range, see that board's documentation).*

Relative Method

The Relative Method adjusts the volume of an output *by* a specific decibel amount.

To adjust an output's volume by a specific decibel amount:

1. Enter the Volume Relative command below. Replace the "#"s with the level and output number(s) and replace the "^^^" with the decibel level (entered as a decimal number; see "General Rules for Audio" on the previous page).
   `CL#O#VR^^^T`

Volume Relative Examples

BCS Command	Action
`CL0O3VR60T`	Increases volume by 6.0 dB for Output 3 on Level 0
`CL0O1 2VR-120T`	Decreases volume by 12.0 dB for Outputs 1 and 2 on Level 0

Note: *If the decibel level requested is outside the range for the selected output, the system will respond with an "X" indicating an invalid value was entered (for a specific audio board's volume adjustment range, see the board's documentation).*

Increment/Decrement Method

The Increment/Decrement Method increases or decreases the volume of an output by a step. You may need to repeat the command to hear an audible difference.

To increase an output's volume by a step:

1. Enter the Volume Increment command below. Replace the "#"s with the level and output number(s).
   `CL#O#VS+T`

To decrease an output's volume by a step:

1. Enter the Volume Decrement command below. Replace the "#"s with the level and output number(s).
   `CL#O#VS-T`

Volume Increment and Decrement Examples

BCS Command	Action
`CL0O3VS+T`	Increases volume a step for Output 3 on Level 0
`CL0O4 8VS-T`	Decreases volume a step for Outputs 4 and 8 on Level 0

Note: *If the decibel level requested is outside the range for the selected output, the system will respond with an "X" indicating an invalid value was requested (for a specific audio board's volume adjustment range, see the board's documentaion).*

Applying/Removing Mute to Volume

Not all systems with audio support the mute option. If your system supports the mute option, outputs can be muted and un-muted using BCS commands. Inputs cannot be muted.

Note: *For BCS purposes, VM refers to volume mute, not virtual matrix.*

Applying Mute

To mute an output:

1. Enter the Volume Mute command below. Replace the "#"s with the level and output number(s).
   `CL#O#VMT`

Removing Mute

Un-mute returns an output to its previous un-muted volume level. (Entering any other Volume command for that output will also un-mute the signal).

To un-mute an output:

1. Enter the Volume Un-mute command below. Replace the "#"s with the level and output number(s).
   `CL#O#VUT`

Volume Mute and Unmute Examples

BCS Command	Action
CL0O24VMT	Mutes Output 24 on Level 0
CL0O2 4VMT	Mutes Outputs 2 and 4 on Level 0
CL0O2:8VMT	Mutes Outputs 2, 3, 4, 5, 6, 7, and 8 on Level 0
CL0O5VUT	Unmutes Output 5 on Level 0
CL0O11 15VUT	Unmutes Outputs 11 and 15 on Level 0

Verifying Volume Status

Note: *Multiple levels or outputs cannot be entered in volume status commands.*

The volume setting of the output will display in parentheses ( ), even if the output is not receiving a signal. The decibel amount in the result is specified as an integer number representing the actual decibel value multiplied by 10. For example, if the result is -480, the decibel level is at -48 or if the result is 65, the decibel level is at 6.5. If the status result is (M), the volume is muted.

To verify the volume status of a specific output:

1. Enter the Verify Volume Status command below. Replace the "#"s with the level and output number.
   SL#O#VT

Volume Status Examples

BCS Command	Status Result	Explanation of Result
SL0O37VT	SL0O37VT(100)	Volume for Output 37 on Level 0 is at 10 dB
SL0O8VT	SL0O8VT(5)	Volume for Output 8 on Level 0 is at 0.5 dB
SL0O22VT	SL0O22VT(-700)	Volume for Output 22 on Level 0 is at -70 dB
SL0O41VT	SL0O41VT(M)	Verifies the volume is muted for Output 41 on Level 0

Adjusting Digital Input Gain

For BCS purposes, adjustments to input signals are referred to as digital gain adjustments, while similar adjustments to output signals are referred to as volume adjustments. Not all systems with audio support digital input gain adjustments. Although digital input gain is normally set during installation, if your system supports digital input gain control, gain adjustments can be made at any time during normal operation. Digital input gain range is -10 dB to +10 dB. Inputs cannot be muted.

Digital input gain should be adjusted as part of system setup. If adjusting input gain, we recommend doing so before making any output adjustments.

Caution: *We strongly recommend that input gain adjustments be made only by a qualified installer or dealer.*

The purpose of controlling the input gain (the nominal level of the signal from the source device) is to allow source signals of various amplitudes to be equalized before they are routed and the volume is adjusted. Equalizing source levels provides a consistent reference for volume adjustments and eliminates jumps when routing a new input to an output.

Typical uses for input gain include switching consumer and professional grade audio equipment (whose levels can vary noticeably) in the same routing system. Input gain adjustment is also used for equalizing amplitudes between balanced and unbalanced inputs.

Note: *The total through-system gain (the amount of input gain plus the amount of output gain) for any input to output routing path is automatically limited by the matrix switcher. (For the value of through-system gain and other audio specifications, see your matrix switcher's instruction manual.) If a volume command is entered that exceeds the matrix switcher's specifications, the command will be accepted (and will be indicated in status results) but will not result in an audible difference if the dB value entered is outside of the matrix switcher's audio range.*

The following section describes three methods used to adjust digital input gain as part of the process of equalizing input levels. We recommend routing an input *before* adjusting its gain; although not necessary, it can be helpful to hear the adjustment.

To adjust digital input gain use any of the following three methods:

- Absolute – adjusts input gain *to* a specific decibel value
- Relative – adjusts input gain *by* a specific decibel amount
- Increment/Decrement – adjusts input gain up or down a step

Important: *If the level is not specified in a BCS command, the command is executed on the default level (normally Level 0), which is defined in the configuration file. If the level is omitted and the BCS command executes on an unexpected level, check the default level in the configuration file (for systems without a configuration file, check the product documentation).*

To adjust inputs to equalize source levels:

1. Route an input (source) to the first output (destination).
2. Adjust the digital input gain for the input to the desired dB level by using one of the three methods on the following two pages.
3. Repeat Steps 1 and 2 for additional inputs that will be routed to the same output.

Absolute Method

The Absolute Method adjusts digital input gain *to* a specific decibel level.

To adjust digital input gain to a specific decibel level:

1. Enter the Absolute command below. Replace the "#"s with the level and input number(s) and replace the "^^^" with the decibel level (entered as a decimal number; see "General Rules for Audio" on page 12).
   `CL#I#VA^^^T`
2. Repeat Step 1 as necessary for additional sources (inputs) that will be routed to the same destination (output).

Digital Input Gain Absolute Examples

BCS Command	Action
`CL0I22VA70T`	Adjusts input gain to 7.0 dB for Input 22 on Level 0
`CL0I6 7VA-700T`	Adjusts input gain to -70.0 dB for Inputs 6 and 7 on Level 0

Note: *If the input gain adjustment requested results in an overall decibel level outside of the range (above or below) for the specific type of audio board that has been selected for adjustment, the system will respond with an "X" indicating an invalid value was entered. For a specific audio board's input gain adjustment range, see the specific board's documentation.*

Relative Method

The Relative Method adjusts digital input gain *by* a specific decibel amount.

To adjust digital input gain by a specific decibel amount:

1. Enter the Relative command below. Replace the "#"s with the level and input number(s) and replace the "^^^" with the decibel level (entered as a decimal number; see "General Rules for Audio" on page 12).
   `CL#I#VR^^^T`
2. Repeat Step 1 as necessary for additional sources (inputs) that will be routed to the same destination (output).

Digital Input Gain Relative Examples

BCS Command	Action
`CL0I3VR60T`	Increases input gain for Input 3 by 6.0 dB on Level 0
`CL0I1 2VR-120T`	Decreases input gain for Inputs 1 and 2 by 12.0 dB on Level 0

Note: *If the input gain adjustment requested results in an overall decibel level outside of the range (above or below) for the specific type of audio board that has been selected for adjustment, the system will respond with an "X" indicating an invalid value was entered. For a specific audio board's input gain adjustment range, see the specific board's documentation.*

Increment/Decrement Method

The Increment/Decrement Method increases or decreases digital input gain by a step.

To adjust digital input gain up a step:

1. Enter the Increment command below. Replace the "#"s with the level and input number.
   `CL#I#VS+T`
2. Repeat Step 1 as necessary for additional sources (inputs) that will be routed to the same destination (output).

To adjust digital input gain down a step:

1. Enter the Decrement command below. Replace the "#"s with the level and input number.
   `CL#I#VS-T`
2. Repeat Step 1 as necessary for additional sources (inputs) that will be routed to the same destination (output).

Digital Input Gain Increment and Decrement Examples

BCS Command	Action
`CL0I3VS+T`	Adjusts input gain for Input 3 up a step on Level 0
`CL0I4 8VS-T`	Adjusts input gain for Inputs 4 and 8 down a step on Level 0

Note: *If the input gain adjustment requested results in an overall decibel level outside of the range (above or below) for the specific type of audio board that has been selected for adjustment, the system will respond with an "X" indicating an invalid value was entered. For a specific audio board's input gain adjustment range, see the specific board's documentation.*

Verifying Digital Input Gain Status

The digital input gain setting will display in parentheses ( ), even if the input is not receiving a signal. The decibel amount in the result is specified as a decimal number to the tenth place without the decimal point. For example, if the result is -480, the decibel level is at -48 or if the result is 65, the decibel level is at 6.5.

To verify digital input gain status:

1. Enter the Verify Status command below. Replace the "#"s with the level and input number.
   `SL#I#VT`

Digital Input Gain Status Examples

BCS Command	Status Result	Explanation of Result
`SL0I133VT`	`SL0I133VT( 100 )`	Verifies the gain of Input 133 is 10 dB on Level 0
`SL0I240VT`	`SL0I240VT( -700 )`	Verifies the gain of Input 240 is -70 dB on Level 0
`SL0I6VT`	`SL0I6VT( 75 )`	Verifies the gain of Input 16 is at 7.5 dB on Level 0

Adjusting and Verifying Audio with DSP

This chapter covers information unique to products with Digital Signal Processing (DSP) functionality. For information on general audio functions, see "Adjusting and Verifying Audio" on page 12.

AMX AutoPatch products with DSP use BCS commands to make volume adjustments at anytime during normal operation. Balance and tone can also be adjusted at any time using BCS commands.

Equalization bands (see page 22) and digital input gain (see page 16) should be adjusted during system setup.

Caution: *We strongly recommend that input gain adjustments be made only by a qualified installer or dealer.*

If adjusting input gain, we recommend doing so before making any output adjustments.

General Audio Rules for Products with DSP

- Volume is adjusted using any of the following three methods:
  - Absolute – adjusts volume *to* a specific decibel level (see page 13).
  - Relative – increases or decreases volume *by* a specific decibel amount (see page 13).
  - Increment/Decrement – increases or decreases volume a step (see page 14).
- An output does not need to be routed to adjust the volume; however, it may be helpful to hear the adjustment. This also applies to adjusting input gain.
- Enter decibel levels as integer numbers representing the desired decibel value multiplied by 10. For example, +5 dB is entered as 50 and -60.5 dB is entered as -605. (Interpret volume status results in the same way.)
- Do *not* use leading zeros for gain values in audio commands.
- If the requested volume change results in a decibel level outside the valid range for that particular audio component, the system responds with an "X".
- When a muted output is un-muted, the output returns to its previously un-muted volume.
- When an output volume command is sent to a muted output, the output is un-muted and then the volume adjustment is applied.
- Inputs cannot be muted.
- When an input gain command is sent to an input connected to a muted output, the gain is applied to the input and the output remains muted.
- To cancel an incorrect or incomplete command, enter "X".

Important: *If the level is not specified in a BCS command, the command is executed on the default level (normally Level 0), which is defined in the configuration file. If the level is omitted and the BCS command executes on an unexpected level, check the default level in the configuration file (for systems without a configuration file, check the product documentation).*

Adjusting Balance

Note: *The examples below assume a default level which is audio or includes audio. If the default level does not include audio, you must enter a level that includes audio.*

Balance commands tell the output to pan to the left or to the right by a percentage of the total range. Positive percentages pan to the right, and negative percentages pan to the left.

To adjust balance for an output:

1. Enter the balance command below. Replace the "#"s with the output number and replace "^^^" with the percentage.
   `CO#P^^^T`

Balance Examples

BCS Command	Action
`CO9P100T`	Pans Output 9 to the right 100%
`CO7P-25T`	Pans Output 7 to the left 25%

Adjusting Tone

Tone bands (filters) for bass and treble can be adjusted to a specific decibel level at anytime during normal operations. Each tone band has a range of -12 dB to +12 dB. Further frequency adjustments can be made to each output by adjusting the equalization bands (see page 22).

Tone Band (filter)	Range
1	Bass
2	Mid (Mid range is not supported in Precis DSP products)
3	Treble

To adjust the gain of a tone band (filter) for an output:

1. Enter the tone command below. Replace the "#"s with the output number and tone band (filter) number and replace "^^^" with the decibel level. (Enter the decibel level as an integer number representing the desired decibel value multiplied by 10, e.g., -5.0 dB is entered as -50.)
   `CO#F#G^^^T`

Tone Band Examples

BCS Command	Action
`CO5F1G100T`	Adjusts the bass band to 10 dB for Output 5
`CO13F3G-120T`	Adjusts the trebel band to -12 dB for Output 13

Adjusting Equalization Bands

BCS commands can be used to adjust the gain of each EQ band for each output to a specific decibel level. Each equalization band is identified by its center frequency and spans one octave (see the chart below for frequency to band number correspondence). The bands are set for a flat response at the factory. The adjustment range is -12 dB to +12 dB.

EQ Band Frequency	32 Hz	64 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	16 kHz
EQ Band (BCS) Number	1	2	3	4	5	6	7	8	9	10

Multiple bands can be entered in the same command by including spaces or commas between the EQ band numbers. When adjusting multiple bands in the same command, an "E" and a list of the bands is entered first, followed by a "G" and a list of the corresponding gain settings. The number of gain settings must be equal to the number of bands.

To adjust equalization bands for an output:

1. Enter the following command string. Replace the "#"s with the output number(s) and equalization band number(s) and replace the "^^^" with the decibel level.
   `CO#E#G^^^T`

Equalization Bands Example (with visual representation below)

BCS Command	Action
`CO3E2 5 6 7 9G80 10 -60 40 60T`	Adjusts the gain of EQ band 2 to 8 dB, band 5 to 1 dB, band 6 to -6 dB, band 7 to 4 dB, and band 9 to 6 dB for Output 3

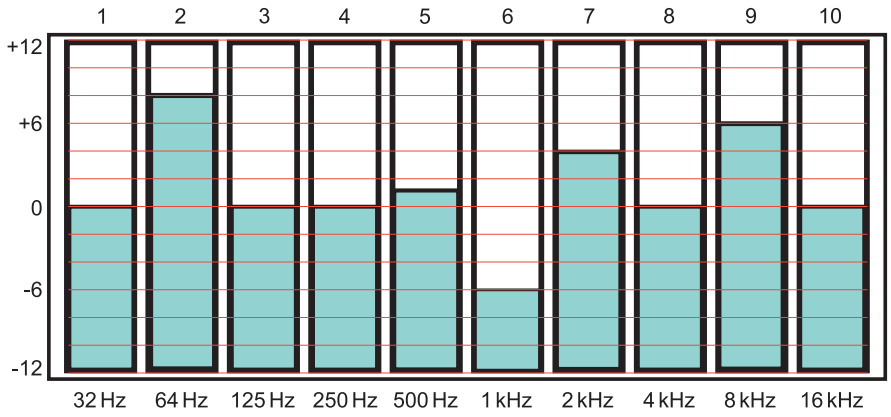

FIG. 1 Visual representation of equalizing output example

Verifying DSP Command Status

The status for DSP command settings will display in parentheses ( ). Balance results are a percentage of the pan right (positive number) or pan left (negative number). Gain results for tone bands and for equalization bands are decibel amounts specified as a decimal number to the tenth place without the decimal point. For example, if the result is -480, the decibel level is at -48 or if the result is 65, the decibel level is at 6.5.

Note: *Multiple levels or outputs cannot be entered in status commands.*

To verify the balance setting of an output:

1. Enter the following command string. Replace the "#"s with the output number.
   `SO#PT`

To verify the gain of a tone band for an output:

1. Enter the following command string. Replace the "#"s with the output number and tone band (filter) number.
   `SO#F#T`

To verify the gain of an equalization band for an output:

1. Enter the following command string. Replace the "#"s with the output number and EQ band.
   `SO#E#T`

DSP Command Status Examples

BCS Command	Status Result	Explanation of Result
SO3PT	SO3PT(100)	Verifies the balance of Output 3 is set 100% to the right
SO2PT	SO2PT(-33)	Verifies the balance of Output 2 is set 33% to the left
SO6F1T	SO6F1T(-120)	Verifies the bass band for Output 6 is at -12 dB
SO3F3T	SO3F3T(90)	Verifies the treble band for Output 3 is at +9 dB
SO17E1T	SO17E1T(90)	Verifies the gain of EQ band 1 is set to +9 dB for Output 17
SO4E1 2 3T	SO4E1 2 3T (60 -90 -120)	Verifies the gain of EQ band 1 is set to +6 dB, band 2 is set to -9 dB, and band 3 is set to -12 dB for Output 4

Appendix A – Product Specific BCS Commands

Product Specific Overview

This appendix provides an overview of BCS command information that applies to specific AMX products. Product families are listed in alphabetical order; heritage systems follow current products.

AMX Products Covered

- Enova DGX 8, Enova DGX 16, and Enova DGX 32 (page 27)
- Epica-128 and Epica-256 (page 28)
- Epica DG, Epica DGX 16, Epica DGX 32, and Epica DGX 144 (page 29)
- HDMI-UTPRO-0808 (page 30)
- Modula and Modula CatPro (page 31)
- Octaire (page 32)
- Optima and Optima SD (page 33)
- Precis DSP (page 34)
- Precis LT (page 35)
- Precis SD (page 35)
- Heritage Systems (page 37)
  - 1Y Series, 4Y-DM, 8Y-DM, and 8Y-XL
  - 8Y-3000
  - Precis 6x2
  - Precis (300 MHz)
  - Precis HT

Basic Support

BCS command characters are listed in the tables on page 4. Basic command string formats are listed in the tables on page 3.

All supported enclosures (with the exception of some heritage systems) support these commands:

- Change
- Disconnect
- Status

All enclosures that have digital gain support these commands:

- Digital output volume adjustments
- Digital input gain adjustments
- Audio status for output volume and input gain

The chart on the following page indicates additional features supported by specific product families.

BCS Quick Reference Chart

The chart below lists AMX products (heritage products are not included; see page 37) and indicates which BCS commands in addition to the ones listed on the previous page they support.

	General Commands					DSP Commands (Digital Signal Processing)		
	Execute Local Presets (defined in XNConnect) page 10	Define and Execute Global Presets page 11	Error Code Reporting* page 41	Diagnostic page 45 (check product also)	Fragmented Status Reporting (enabled in XNConnect) page 9	Balance Pan page 21	Filter Tone page 21	Equalization Band page 22
Epica-128 **Epica-256**	●	●	●**		●**			
Enova DGX 8/16/32 **Epica DG** **Epica DGX 16/32** **Epica DGX 144**	●	●	●	●	●			
HDMI-UTPRO-0808		●	●	●				
Modula **Modula CatPro**	●	●	●**		●**			
Octaire		●	●	●				
Optima **Optima SD**	●	●	●	●	●**			
Precis DSP				●		●	●	●
Precis LT								
Precis SD	●	●	●	●				

* Error code reporting displays a seven-digit code (e.g., `EFF8002`) when a command string is entered and not accepted. This code is in addition to (or instead of) the single character that displays when an error is in a command string.

** Not all models of this product family support this command; to determine which models do, see the specific product section in this appendix.

If you have any questions regarding which features are supported by your system, record the system serial number(s), determine the Application Code version (see below), and contact technical support (see page 43).

Application Code Version

Important: *We recommend determining which Application Code version your enclosure uses; full support of some BCS commands depends upon the Application Code version. Most of the heritage systems do not support the ~scr! command to display a splash screen. To determine the Application Code version for these systems, before applying power, attach a PC to the enclosure's serial port with a null modem serial cable. Open HyperTerminal (or other terminal emulation program) on the PC and power up the system. View the display in HyperTerminal for system information including the Application Code version.*

To determine the system's Application Code version:

1. View the long splash screen by entering `~scr!` (see the table above for products that support Diagnostic commands and enter `~scr1v3!`) into HyperTerminal.
   The "Hardware Driver" is the enclosure's Application Code version.
   To determine if the Application Code version displayed supports the relevant BCS command, see the applicable section for your system in the following pages.

Enova DGX 8, Enova DGX 16, and Enova DGX 32

The Enova DGX 8, Enova DGX 16, and Enova DGX 32 support the following items:

General Commands

- Executing and disconnecting switches (see page 6 and page 7)
- Verifying signal status (see page 8)
- Executing local presets – predefined in XNConnect (see page 10); the Enova DGX 8/16/32 supports 64 local presets
- Defining and executing global presets (see page 11); these products support 64 global presets

ICSP SEND_COMMANDs

The Enova DGX 8/16/32 supports basic BCS commands incorporated into SEND_COMMANDs (up to 1024 characters packaged in a single BCS command) for control and switching. See the product manual for additional information on using SEND_COMMANDs.

Important: *SEND_COMMANDs for Enova DGX 8/16/32 require a final "`T`" to execute the command.*

Specific Commands

The Enova DGX 8/16/3232 supports fragmented status reporting (see page 9) and error code reporting (see page 41).

Diagnostic Commands

The Enova DGX 8/16/32 displays system information in the splash screen for diagnostic purposes. The information indicates the current status and well-being for some of the system components. For information on system diagnostics that includes the commands and applies to all systems that support diagnostic commands, see page 45.

Component Settings

The Enova DGX 8/16/32 supports the eight component identity number settings (`i0` through `i7`) in the following table.

Component	Identity Number
All Components	`i0`
Enclosure	`i1`
Storage Blocks	`i2`
Communication Interfaces	`i3`
Hardware / Boards	`i4`
VM Configuration	`i5`
Power System	`i6`
System Sensors	`i7`

Tip: *The information in the table above is displayed when you enter* `~scr!` *or* `~scrv0i0!`

Auxiliary Commands

Auxiliary Commands Supported by Enova DGX 8/16/32	
To cause a warm reboot	`~app!`
To back up system settings to the SD card	`~sysb!`
To restore system settings from the SD card	`~sysr!`

Epica-128 and Epica-256

The Epica-128 and the Epica-256 support the following items:

General Commands

- Executing and disconnecting switches (see page 6 and page 7)
- Verifying signal status (see page 8)
- Executing local presets – predefined in XNConnect (see page 10); the Epica-128 supports 120 local presets and the Epica-256 supports 60 local presets
- Defining and executing global presets (see page 11); these products support 64 global presets

Audio Commands (for systems that support digital gain and volume control)

If the Epica-128 or Epica-256 supports digital control of audio signals, it supports the following audio commands.

- Digital output volume control – absolute, relative, and increment/decrement methods (see page 13)
- Verifying volume status (see page 15)
- Muting and un-muting outputs (see page 14)
- Digital input gain control – absolute, relative, and increment/decrement methods (see page 16)
- Verifying digital input gain status (see page 18)

Specific Commands and Conditions

- Epica-128 and Epica-256 models with Application Code v 2.6.0 or later support fragmented status reporting (see page 9) and error code reporting (see page 41)

Auxiliary Commands

Auxiliary Commands Supported by the Epica-128 and Epica-256	
To cause a warm reboot	`~app!`
To view a long splash screen with advanced system information	`~scr!`

Epica DG, Epica DGX 16, Epica DGX 32, and Epica DGX 144

The Epica DG, Epica DGX 16, Epica DGX 32, and Epica DGX 144 support the following items:

General Commands

- Executing and disconnecting switches (see page 6 and page 7)
- Verifying signal status (see page 8)
- Executing local presets – predefined in XNConnect (see page 10); the Epica DG and Epica DGX 144 each support 335 local presets, and the Epica DGX 16 and Epica DGX 32 each support 64 local presets
- Defining and executing global presets (see page 11); these products support 64 global presets

Specific Commands

The Epica DG, Epica DGX 16, Epica DGX 32, and Epica DGX 144 support fragmented status reporting (see page 9) and error code reporting (see page 41).

Diagnostic Commands

The Epica DG, Epica DGX 16, Epica DGX 32, and Epica DGX 144 display system information in the splash screen for diagnostic purposes. The information indicates the current status and well-being for some of the system components. For information on system diagnostics that includes the commands and applies to all systems that support diagnostic commands, see page 45.

Component Settings

The Epica DG, Epica DGX 16, Epica DGX 32, and Epica DGX 144 all support the eight component identity number settings (`i0` through `i7`) in the following table.

Component	Identity Number
All Components	`i0`
Enclosure	`i1`
Storage Blocks	`i2`
Communication Interfaces	`i3`
Hardware / Boards	`i4`
VM Configuration	`i5`
Power System	`i6`
System Sensors	`i7`

Tip: *The information in the above table is displayed when you enter* `~scr!` *or* `~scrv0i0!`

Auxiliary Commands

Auxiliary Commands Supported by Epica DG, Epica DGX 16, Epica DGX 32, and Epica DGX 144	
To cause a warm reboot	`~app!`

HDMI-UTPRO-0808

HDMI UTPro systems support the following items:

General Commands

- Executing and disconnecting switches (see page 6 and page 7)
- Verifying signal status (see page 8)
- Defining and executing global presets (see page 11); this product supports 16 global presets
- Error Code Reporting (see page 41)

ICSP SEND_COMMANDs

The HDMI UTPro supports basic BCS commands incorporated into SEND_COMMANDs (up to 1024 characters packaged in a single BCS command) for control and switching. See the product manual for additional information on using SEND_COMMANDs.

Important: *SEND_COMMANDs for the HDMI UTPro do not use a final "`T`" to execute the command.*

Diagnostic Commands

The HDMI UTPro displays system information in the splash screen for diagnostic purposes. The information indicates the current status and well-being for some of the system components. For information on system diagnostics that includes the commands and applies to all systems that support diagnostic commands, see page 45.

Component Settings

The HDMI UTPro supports the 6 component identity number settings (`i0` through `i5`) in the following table.

Component	Identity Number
All Components	`i0`
Enclosure	`i1`
Storage Blocks	`i2`
Communication Interfaces	`i3`
Hardware / Boards	`i4`
VM Configuration	`i5`

Tip: *The information in the above table is displayed when you enter* `~scr!` *or* `~scrv0i0!`

Auxiliary Commands

Auxiliary Commands Supported by HDMI-UTPRO-0808	
To cause a warm reboot	`~app!`
To persist the Sink Key cache (system will warm boot)*	`~app!`
To clear the Sink Key cache*	`@et`

* For additional information on persisting and clearing the Sink Key cache, see the *Instruction Manual – HDMI-UTPRO-0808*.

Note: *The* `@et` *command also disconnects all currently routed signals. The response to the* `@et` *command is* `@eV`.

Modula and Modula CatPro

Modula and Modula CatPro systems support the following items:

General Commands

- Executing and disconnecting switches (see page 6 and page 7)
- Verifying signal status (see page 8)
- Executing local presets – predefined in XNConnect (see page 10); these products support 254 local presets
- Defining and executing global presets (see page 11); these products support 64 global presets

Audio Commands (for systems that support digital gain and volume control)

If the Modula or Modula CatPro supports digital control of audio signals, it supports the following audio commands.

- Digital output volume control – absolute, relative, and increment/decrement methods (see page 13)
- Verifying volume status (see page 15)
- Muting and un-muting outputs (see page 14)
- Digital input gain control – absolute, relative, and increment/decrement methods (see page 16)
- Verifying digital input gain status (see page 18)

Specific Commands and Conditions

- Modula and Modula CatPro models with Application Code v 2.6.0 or later support fragmented status reporting (see page 9)
- Modula and Modula CatPro models with Application Code v 2.4.2 support a limited set of system error codes. Error code reporting is always enabled by default and cannot be turned off (see page 41)

Important: *If the Modula system contains RS-422 boards (which do bi-directional switching), we recommend reading the information in the "Instruction Manual – Modula" on these boards before using BCS commands to control them.*

Auxiliary Commands

Auxiliary Commands Supported by Modula and Modula CatPro	
To cause a warm reboot	`~app!`
To view a long splash screen with advanced system information	`~scr!`

Octaire

Octaire systems support the following items:

General Commands

- Executing and disconnecting switches (see page 6 and page 7)
- Verifying signal status (see page 8)
- Defining and executing global presets (see page 11); this product supports 64 global presets
- Error Code Reporting (see page 41)

Audio Commands (if system contains audio)

If the Octaire routes audio signals, it supports the following audio commands.

- Digital output volume control – absolute, relative, and increment/decrement methods (see page 13)
- Verifying volume status (see page 15)
- Muting and un-muting outputs (see page 14)
- Digital input gain control – absolute, relative, and increment/decrement methods (see page 16)
- Verifying input gain status (see page 18)

Specific Commands and Conditions

- When entering commands, use `L0` (or omit level) for routing the All level (audio-follow-video), `L1` for routing the Video level, and `L2` for routing the Audio level
- Does *not* support local preset commands

Diagnostic Commands

The Octaire displays system information in its splash screen for diagnostic purposes. The information indicates the current status and well-being for some of the system components. For information on system diagnostics that includes the commands and applies to all systems that support diagnostic commands, see page 45.

Component Settings

The Octaire supports six component identity number settings (`i0` through `i4` and `i7`) in the following table.

Component	Identity Number
All Components	`i0`
Enclosure	`i1`
Storage Blocks	`i2`
Communication Interfaces	`i3`
Hardware / Boards	`i4`
System Sensors	`i7`

Tip: *The information in the table above is displayed when you enter* `~scr!` *or* `~scri0v0!`

Auxiliary Commands

Auxiliary Commands Supported by Octaire	
To cause a warm reboot	`~app!`
To view a splash screen with the lowest level of verbosity	`~scr!`

Optima and Optima SD

Optima and Optima SD systems support the following items:

General Commands

- Executing and disconnecting switches (see page 6 and page 7)
- Verifying signal status (see page 8)
- Executing local presets – predefined in XNConnect (see page 10); these products support 16 local presets
- Defining and executing global presets (see page 11); these products support 16 global presets
- Error Code Reporting (see page 41)

Audio Commands (for systems that support digital gain and volume control)

If the Optima or Optima SD supports digital control of audio signals, it supports the following audio commands.

- Digital output volume control – absolute, relative, and increment/decrement methods (see page 13)
- Verifying volume status (see page 15)
- Muting and un-muting outputs (see page 14)
- Digital input gain control – absolute, relative, and increment/decrement methods (see page 16)
- Verifying input gain status (see page 18)

Specific Commands and Conditions

- Optima and Optima SD models with Application Code v 1.2.0 or later support fragmented status reporting (see page 9)

Diagnostic Commands

Optima and Optima SD models display system information in their splash screens for diagnostic purposes. The information indicates the current status and well-being for some of the system components. For information on system diagnostics that includes the commands and applies to all systems that support diagnostic commands, see page 45.

Component Settings

Optima and Optima SD models support six component identity number settings (`i0` through `i5`) in the following table.

Component	Identity Number
All Components	`i0`
Enclosure	`i1`
Storage Blocks	`i2`
Communication Interfaces	`i3`
Hardware / Boards	`i4`
VM Configuration	`i5`

Tip: *The information in the table above is displayed when you enter* `~scr!` *or* `~scri0v0!`

Auxiliary Commands

Auxiliary Commands Supported by Optima and Optima SD	
To cause a warm reboot	`~app!`
To view a long splash screen with advanced system information	`~scr!`
To persist the Sink Key cache (system will warm boot)*	`~app!`
To clear the Sink Key cache*	`@et`

* Used only in Optima enclosures containing HDMI I/O boards. For additional information on persisting and clearing the Sink Key cache, see the *Instruction Manual – Optima.*

Note: *The* `@et` *command also disconnects all currently routed signals. The response to the* `@et` *command is* `@eV`*.*

Precis DSP

Precis DSP models support the following items:

General Commands and Conditions

- Executing and disconnecting switches (see page 6 and page 7)
- Verifying signal status (see page 8)

Specific Commands and Conditions

- If the Level "`L`" designation is omitted, the command is executed on the audio level. When entering BCS commands, either omit the Level designation or use Level 0 or Level 2 (Level 0 indicates all levels and the Precis DSP models only have one level)
- Does not support global or local preset commands
- Supports using a colon "`:`" to designate a range of destination numbers in multiple number entries

Audio Commands

- Supports full DSP functionality (see page 25)
- Digital output volume control – absolute, relative, and increment/decrement methods (see page 13)
- Verifying volume status (see page 15)
- Muting and un-muting outputs (see page 14)
- Digital input gain control – absolute, relative, and increment/decrement methods (see page 16)
- Verifying digital input gain status (see page 18)

Diagnostic Commands

Precis DSP models display system information in their splash screens for diagnostic purposes. The information indicates the current status and well-being for some of the system components. For information on system diagnostics that includes the commands and applies to all systems that support diagnostic commands, see page 45.

Component Settings

The Precis DSP supports six component identity number settings (`i0` through `i5`) in the following table.

Component	Identity Number
All Components	`i0`
Enclosure	`i1`
Storage Blocks	`i2`
Communication Interfaces	`i3`
Hardware / Boards	`i4`
VM Configuration	`i5`

Tip: *The information in the table above is displayed when you enter* `~scr!` *or* `~scri0v0!`

Auxiliary Commands

Auxiliary Commands Supported by Precis DSP	
To cause a warm reboot	`~app!`
To view a long splash screen with advanced system information	`~scr!`

Precis LT

Precis LT models support the following items:

General Commands and Conditions

- Executing and disconnecting switches (see page 6 and page 7)
- Verifying signal status (see page 8)

Specific Commands and Conditions

- The Precis LT uses Level 1 for video and Level 2 for audio. To route video or audio signals separately, enter Level 1 for video only or Level 2 for audio only. Precis LT does not recognize Level 0 (`L0`) as part of a BCS command. To achieve the equivalent of routing signals on Level 0 (audio-follow-video), either omit the level command, (`CI3O8T`) or enter both level numbers by entering a space between each number (`CL1 2I3O8T`)
- Does not support audio commands
- Does not support global or local preset commands
- Does not support using a colon "`:`" to designate a range of destination numbers in multiple number entries. To designate a range of numbers, insert a space between each number in the range

Precis SD

Note: *This section also applies to any Precis (500 MHz) models built before the Precis SD was released.*

Precis SD models support the following items:

General Commands and Conditions

- Executing and disconnecting switches (see page 6 and page 7)
- Verifying signal status (see page 8)
- Executing local presets – predefined in XNConnect (see page 10); this product supports 64 local presets
- Defining and executing global preset (see page 11); this product supports 64 global presets
- Error Code Reporting (see page 41)

Specific Commands and Conditions

- Precis SD models with front control panels will accept BCS commands while the panel is locked, but BCS commands cannot be used to unlock the front panel
- Executing local presets – predefined in XNConnect (see page 10)
- Supports auxiliary commands
- Supports diagnostic commands
- To designate a range of numbers: enter the first number in the range, followed by a colon "`:`", and then enter the last number in the range
- Supports limited error code reporting. An "`E`" appearing as the result of a Status command indicates a communication failure between the CPU and the control panel. To establish communication, use the control panel to execute a switch or power down and then power up the system

Precis SD (continued)

Audio Commands (for systems that support digital gain and volume control)

If the control panel has a Volume Adjust Key, then the system supports the following audio commands:

- Digital output volume control – absolute, relative, and increment/decrement methods (see page 13)
- Verifying volume status (see page 15)
- Muting and un-muting outputs (see page 14)
- Digital input gain control – absolute, relative, and increment/decrement methods (see page 16)
- Verifying digital input gain status (see page 18)

Diagnostic Commands

The Precis SD displays system information on the splash screen for diagnostic purposes. The information indicates the current status and well-being for some of the system components. For information on system diagnostics that includes the commands and applies to all systems that support diagnostic commands, see page 45.

Component Settings

The Precis SD supports six component identity number settings (`i0` through `i5`) in the following table.

Component	Identity Number
All Components	`i0`
Enclosure	`i1`
Storage Blocks	`i2`
Communication Interfaces	`i3`
Hardware / Boards	`i4`
VM Configuration	`i5`

Tip: *The information in the table above is displayed when you enter* `~scr!` *or* `~scri0v1!`

Auxiliary Commands

Auxiliary Commands Supported by Precis SD	
To cause a warm reboot	`~app!`
To view a splash screen with advanced system information	`~scr!`

Heritage Systems

Note: *If you have a heritage product (a discontinued product, i.e., not listed in the previous pages), refer to this section. Typically, older heritage products use BCS commands similar to the way the 1Y Series does.*

1Y Series, 4Y-DM, 8Y-DM, and 8Y-XL

1Y Series, 4Y-DM, 8Y-DM, and 8Y-XL systems support the following items:

General Commands

- Executing and disconnecting* switches (see page 6 and page 7)
- Verifying signal status (see page 8)
- Defining and executing global presets (see page 11)**

* The heritage products 4Y-DM, 8Y-DM, and 8Y-XL do not support the Disconnect command.

** The 1Y and the 4Y-DM are the only heritage products that support global presets.

Specific Commands and Conditions

- Does not support local presets
- Some models may be case-sensitive and require BCS commands to be entered in all caps

Tip: *If the response to a command string contains the characters "?" or "x", instead of the characters you entered, re-enter the command with all capital letters.*

BCS commands can be used to program and change the configuration word on some heritage systems. The configuration word is a hexadecimal number that tells the matrix how to set the baud rate, choose the number of SBCs to poll, and whether or not to echo serial commands on the control panel. For instructions on changing the configuration word, see the *Instruction Manual – 1Y Series Matrix Switchers* at **www.amx.com**.

8Y-3000

8Y-3000 systems support the following items:

General Commands

- Executing and disconnecting switches (see page 6 and page 7)
- Verifying signal status (see page 8)
- Executing local presets – predefined in XNConnect (see page 10)
- Defining and executing global presets (see page 11)

Specific Commands and Conditions

- 8Y-3000 models with Application Code v 1.2.0 or later support fragmented status reporting (see page 9)
- 8Y-3000 models with Application Code v 2.4.2 or later support a limited set of system error codes. Error code reporting is always enabled by default and cannot be turned off (see page 41)

8Y-3000 (continued)

Audio Commands (for systems that support digital gain and volume control)

If the 8Y-3000 supports digital control of audio signals, it supports the following audio commands.

- Digital output volume control – absolute, relative, and increment/decrement methods (see page 13)
- Verifying volume status (see page 15)
- Muting and un-muting outputs (see page 14)
- Digital input gain control – absolute, relative, and increment/decrement methods (see page 16)
- Verifying digital input gain status (see page 18)

Auxiliary Commands

Auxiliary Commands Supported by 8Y-3000	
To cause a warm reboot	`~app!`
To view a long splash screen with advanced system information	`~scr!`

Precis 6x2

Precis 6x2 models support the following items:

General Commands

- Executing and disconnecting switches (see page 6 and page 7)
- Verifying signal status (see page 8)

Specific Commands and Conditions

- If the Level "`L`" designation is omitted, the command is executed on the default level, which is Level 0 (audio-follow-video). To route video or audio signals separately, enter Level 1 for video only or Level 2 for audio only
- The Precis 6x2 with a front control panel will accept BCS commands while the panel is locked, but BCS commands cannot be used to unlock the front panel
- The Precis 6x2 is equipped with a Standby switch. During Standby mode, BCS commands cannot be entered
- Does not support audio commands
- Does not support global or local preset commands
- Does not support auxiliary commands
- Supports limited error code reporting. An "`E`" appearing as the result of a Status command indicates a communication failure between the CPU and the control panel. To establish communication, use the control panel to execute a switch or power down and then power up the system

Precis (300 MHz)

Precis (300 MHz) models support the following items:

General Commands and Conditions

- Executing and disconnecting switches (see page 6 and page 7)
- Verifying signal status (see page 8)
- Executing local presets – predefined in XNConnect (see page 10)

Specific Commands and Conditions

- Precis (300 MHz) models with front control panels will accept BCS commands while the panel is locked, but BCS commands cannot be used to unlock the front panel
- A range of numbers *cannot* be entered by using a colon "**:**"
  To designate a range of numbers, insert a space between each number in the range
- Does not support global presets
- Does not support auxiliary commands
- Supports limited error code reporting. An "E" appearing as the result of a Status command indicates a communication failure between the CPU and the control panel. To establish communication, use the control panel to execute a switch or power down and then power up the system

Audio Commands (systems that support digital gain and volume control)

If control panel has a Volume Adjust Key, then the system supports the following audio commands:

- Digital output volume control – absolute, relative, and increment/decrement methods (see page 13)
- Verifying volume status (see page 15)
- Digital input gain control – absolute, relative, and increment/decrement methods (see page 16)
- Verifying digital input gain status (see page 18)

Precis HT

Precis HT models support the following items:

General Commands and Conditions

- Executing and disconnecting switches (see page 6 and page 7)
- Verifying signal status (see page 8)
- Executing local presets – predefined in XNConnect (see page 10); supports 1280 local presets

Specific Commands and Conditions

- Precis HT models will accept BCS commands while the front control panel is locked, but BCS commands cannot be used to unlock the front panel
- A range of numbers *cannot* be entered by using a colon "**:**"
  To designate a range of numbers, insert a space between each number in the range
- Does not support global presets
- Does not support auxiliary commands
- Supports limited error code reporting. An "E" appearing as the result of a Status command indicates a communication failure between the CPU and the control panel. To establish communication, use the control panel to execute a switch or power down and then power up the system

Audio Commands (for analog audio signals only)

- Digital output volume control – absolute, relative, and increment/decrement methods (see page 13)
- Verifying volume status (see page 15)
- Digital input gain control – absolute, relative, and increment/decrement methods (see page 16)
- Verifying digital input gain status (see page 18)

Appendix B – Error Code Reporting

When a command string is entered but not accepted, a different character than the one entered will appear. All of the AMX systems listed in the "Product Specific" Appendix support limited error code reporting (displaying a single character). Advanced systems support error codes numbers (alone or in addition to a single character) if the error code reporting is enabled.

Limited Error Codes; Error Code Numbers and Prefixes

Limited Error Codes

If a "?" appears instead of the command character or number you entered, the system did not understand the command because the command string format contained an error (e.g., not indicating an input in a Change command).

If an "X" appears instead of the command character or number you entered, the system understood the command, but did not execute all or part of the command. For example, an "X" may appear when entering an invalid value (such as Output 272 in a system that only has 256 outputs) or requesting a volume setting which results in a decibel level that is outside of the range for the board / connector set.

Precis LT only – If an "E" appears instead of the command character or number entered in a Status command, a communication failure occured between the CPU and the control panel.

Troubleshooting

When error code reporting is enabled, error codes can appear in a terminal emulation program (such as HyperTerminal).

When you are using BCS commands, one common troubleshooting strategy is to enter the command again. Often the command has simply been entered incorrectly (e.g., omitting an output in a Change command). In other cases, the command has specified a value that is not valid.

When you are using an external controller, one of the most common troubleshooting strategies is to resend the command to see if the error was simply a time out error.

Error Code Numbers

In systems that support error code reporting, an error code number beginning with E# or W# will be displayed in addition to the command string with a ? or x. In some systems, the error code will appear alone. Sometimes error codes appear if the system's status changes, even though a command string was not entered.

This following section provides an overview of common error codes that can appear for systems when this feature is enabled.

Error Code Prefixes

First letter of the code indicates:

- E – Error
- W – Warning
- A – Alarm*
- I – Information*

* Because these codes very rarely appear, they are not included in the table on the following page.

For systems that support system error code reporting, the default is error code reporting disabled. We recommend enabling error code reporting when a command string response contains the characters "?" or "X", when troubleshooting the system, or when directed by technical support.

Enabling Error Code Reporting

Error code reporting can be enabled or turned off with BCS commands entered into a terminal emulation program.

To enable error code reporting:

1. Enter `$ERR=1!`
   The system responds with V.

Note: *If the power is cycled, you will need to enable error code reporting again.*

To turn off error code reporting:

1. Enter `$ERR=0!`

Common System Error Codes

The table below lists the error code, the name of the code, the meaning of the code, and some basic troubleshooting strategies. This list is not intended to be comprehensive, nor does it apply to all products. If an error code appears that is not listed, note the specific number and contact technical support (see page 43).

Most Common System Error Codes

Error Code	Meaning	Troubleshooting Strategies
E01000A Enclosure timeout error	One or more of the enclosures in a multi-enclosure system did not acknowledge a control operation command.	• Resend the command. • Check the Status LED on the rear of each enclosure. If any of the LEDs are red, contact technical support. • Check the power indicators. • Check the link connectors between enclosures.
EFF8002 Transaction timeout error	The operation was not completed before the timer expired.	• Resend the command. • Check the power indicators. • Check the link connections in multi-enclosure systems. • Check that the level used in the command was valid.
E01DFFF Audio request error	Missing hardware support error, e.g., a volume or gain request was made on a level that does not switch audio.	• Resend the command on a level that includes audio.
W010005 Sync timeout error	The system did not receive the vertical interval sync signal. Note that the switch occurred, but not at the sync interval.	• Resend the command. • Check the sync cable connections. • Check the HyperTerminal splash screen to verify that sync is enabled (see the vertical interval sync board / connector documentation). • Check that the sync signal from the generator is being received by the system. • Power the system down and check sync board alignment.

Technical Support

If this manual has not satisfactorily answered your questions regarding BCS commands, please contact your AMX representative or technical support. Have the system's serial number ready. The system's serial number is normally located on the rear of the enclosure.

We recommend recording the system's serial number in an easily accessible location.

AMX Contact Information

- 3000 Research Drive, Richardson, TX 75082
- 800.222.0193
- 469.624.8000
- Fax 469.624.7153
- Technical Support 800.932.6993
- www.amx.com

Appendix C – Programmer's Interface for System Diagnostics

System Component Information

Some of the AMX systems listed in the "Product Specific" Appendix display system information in a splash screen* for diagnostic purposes (see the individual product in the table on page 26 to determine if your system supports diagnostic commands). The information indicates the current status and well-being of the system components.

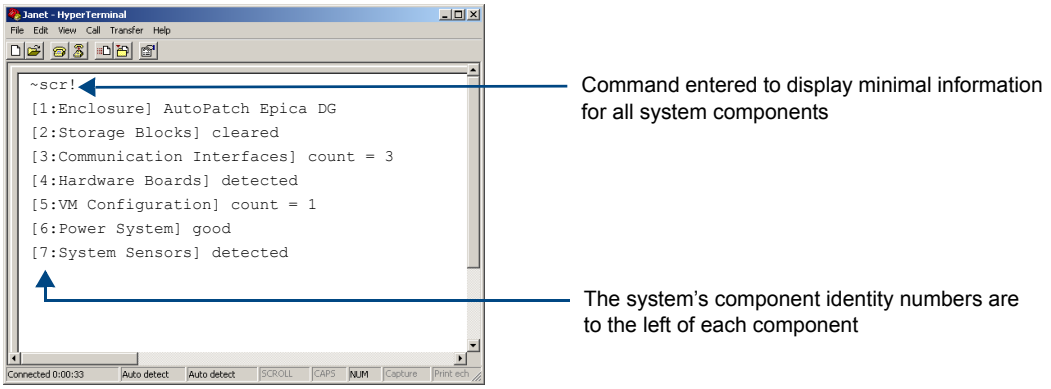

FIG. 2 Example of a default Epica DG splash screen

The splash screen can be accessed using a terminal emulation program, such as HyperTerminal. One of four verbosity** settings is specified to provide a level of detail for information on up to seven system components. Only one verbosity setting and one component identity setting can be entered in a command. The order in which the verbosity and component identity settings are entered is interchangeable. For the number of components a system supports, see the individual product in "Appendix A – Product Specific BCS Commands" starting on page 25.

Note: *In a multi-enclosure system, the splash screen displays information only for the enclosure that is connected directly to the PC.*

* AMX reserves the right to add to the contents of the splash screen at any time, without notice.

** Verbosity (i.e., wordiness) refers to the amount of information provided; the higher the verbosity setting, the more information is displayed.

Verbosity Settings

The verbosity (`v`) settings (`v0`, `v1`, `v2`, `v3`) correspond to the level of detail that will be displayed, with `v0` being the lowest level of detail and `v3` being the highest level.

Component Identity Settings

Detailed information for a single system component can be specified (if the system supports it) by using its identity (`i`) number setting (`i1` through `i7`) in the following table. Minimal information for all supported components can be specified by using the identity number `i0`.

Component	Identity Number
All Components	`i0`
Enclosure	`i1`
Storage Blocks	`i2`
Communication Interfaces	`i3`
Hardware / Boards	`i4`
VM Configuration	`i5`
Power System	`i6`
System Sensors	`i7`

Note: *For the number of components that individual products support, see "Appendix A – Product Specific BCS Commands" on page 25.*

Default Settings

- At system boot, the `~scrv0i1!` setting is displayed.
- If the verbosity setting is omitted, the verbosity level will be the lowest (`v0`).
- The component setting must be included; otherwise, entering any of the verbosity settings alone will result in a display equivalent to `v0i0`.

If both settings are omitted during a query (`~scr!`), the information displayed will be at the lowest verbosity level for all components (`v0i0`) (FIG. 2 on page 45).

Using BCS to Access System Diagnostic Information

Instructions are provided for accessing the lowest level of verbosity for all components and for accessing a specific level of verbosity for a specific component.

To access the lowest level of verbosity for all components:

1. Enter `~scr!` or `~scrv0i0!`

Note: *Either of these commands provides a "menu" of the identity numbers and their corresponding components (FIG. 2 on page 45).*

Only one verbosity setting and one component setting can be entered in a command. The order in which the verbosity and component identity settings are entered is interchangeable.

To access a specific level of verbosity for a specific component:

1. Enter `~scr` (to access the splash screen).
2. Enter the verbosity level setting `v#` and the component's identity setting `i#`. Either may be specified first.
3. Enter `!` (to send the command).

Diagnostic Commands for Products Supporting Component Information in Splash Screen	
To access the diagnostic splash screen	`~scr!`
To access a specific level of information for a specific component. Replace the "#"s with the applicable values (i = identity number, v = verbosity level)	`~scri#v#!`

Diagnostic Command Examples

BCS Command	Action
`~scr!` or `~scri0v1`	Accesses the lowest level of detail for all components
`~scri6v3!` or `~scrv3i6!`	Displays the highest level of detail for the power system

Splash Screen Examples

Following are four examples of splash screen information that could display when different verbosity/component identity settings are specified. Depending on the amount of detail provided, you may need to scroll to see the entire display. All examples provided are for an Epica DG system.

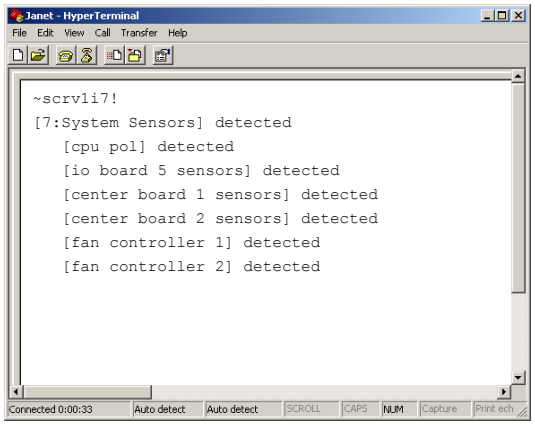

FIG. 3 Display for v1i7 (verbosity 1, component 7)

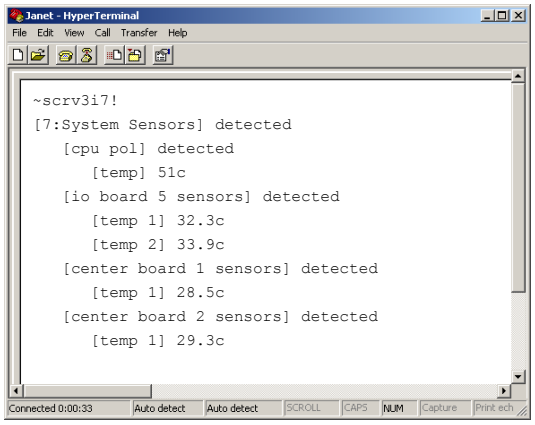

FIG. 4 Display for v3i7 (verbosity 3, component 7)

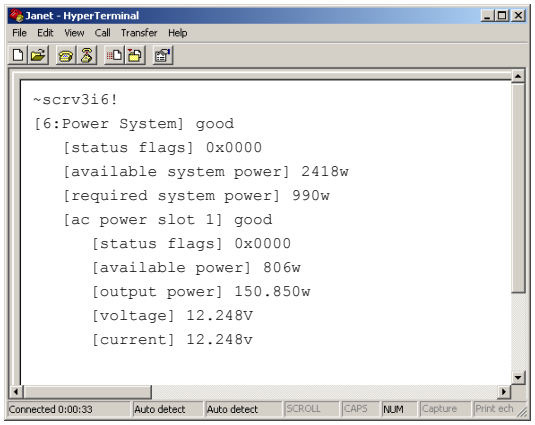

FIG. 5 Display for v3i6 (verbosity 3, component 6)

Splash Screen Examples (continued)

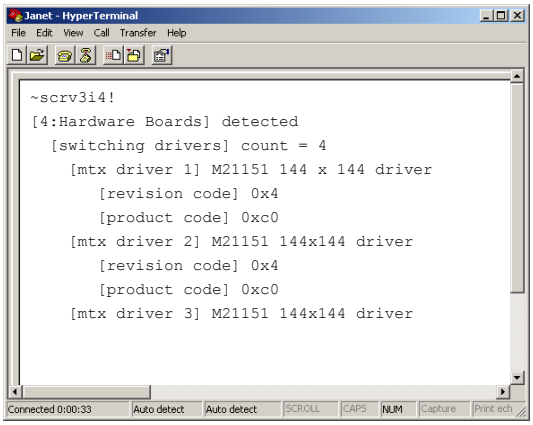

FIG. 6 Display for v3i4 (verbosity 3, component 4)

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